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ABSTRACT

The way in which integrated effort encompassing several epistemologies has developed in one organization is analyzed. The concern is to investigate under what conditions multidisciplinarity flourishes. The data base is a long-term, intensive case study of the Learning Research and Development Center (LRDC) of the University of Pittsburgh since its inception in 1963. Several aspects of the LRDC experience offer themselves as suggestions to others who would seek to construct a multidisciplinary organization. (1) In an environment that contains members of several professions or academic backgrounds, certain safeguards are required for those of "less scientific" fields. (2) There should be frequent attempts at communication among all groups. (3) Joint work is one of the best paths to multidisciplinarity. (4) Certain kinds of professionals and/or certain times in professional careers seem to lend themselves more easily to a multidisciplinary endeavor. (5) Ideal-type roles that embody characteristics of several disciplines can be encouraged as a prototype for the entire environment. (6) Certain organizational characteristics facilitate multidisciplinarity such as placing all groups on the same level in terms of the authority heirarchy or the sharing of personnel and other resources. (7) The multidisciplinary center and the department or school to which a faculty member also belongs must both participate actively in evaluations and decisions regarding promotions or pay raises. (8) Finally, it is necessary that a stable environment be encouraged that provides time and other resources for multidisciplinary knowledge production. (MM)

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MANAGING MULTIDISCIPLINARITY: BUILDING AND BRIDGING EPISTOMOLOGIES IN EDUCATIONAL R&D

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MANAGING MULTIDISCIPLINARITY: BUILDING AND BRIDGING EPISTOMOLOGIES IN EDUCATIONAL R&D

Introduction

Some social science words and the ideas they represent are "faddish" things. They come into being, become prominent and widespread in use, and then disappear, usually from overuse and eventual muddying of their meaning. "Synergistic" come to mind as an example, "interactive" as another. "Multi-" or "inter-" disciplinary must certainly be another. Though not yet fallen into disuse, the terms mean so many things to the many who've adopted them that as quick labels they are close to useless by now.

Still, "multidisciplinarity" has rather specific meanings for us in the sense of: (a) an organizational setting in which more than one discipline or profession are represented; (b) efforts to solve tasks requiring skills, methods, and concepts from different disciplines or professions; and (c) the organizational and professional capacity to operate successfully in such settings, actually using knowledge from different disciplines and professions in adequately solving tasks. In this last sense, one may speak of "managing multidisciplinarity" as the attempt to increase such capacities. This, above all, requires the appreciation that there are alternative cognitive maps or frames of reference, that these can be understood and made accessible so that skills, methods and concepts can be effectively transferred from one to the other, and that all this requires certain social supports.

Building such an environment in an academic setting for the purpose of the production of knowledge requires both strategies of resocialization and organization. Both are necessarily interdependent and must complement each other to succeed. This, in one sense, was precisely the objective of the program which established the Federally funded educational research and development centers.[1]

We have studied one such organization since its inception in 1963. That is the Learning Research and Development Center at the University of Pittsburgh.[2] As students of the organization, whose major interests are in the field of the sociology of knowledge, we report annually to an advisory group of the Center's, its Board of Visitors. Among the several aspects of the Center which we have followed with great interest has been this one: how have professionals from several fields come together under joint aegis and produced an organizational environment--and work flowing from that environment--which reflects the commingling of their disparate viewpoints? It has been our concern to investigate under what conditions multidisciplinarity has flourished. We have, in this one organization, examples of both rather strong success in this endeavor and some not quite so successful.

Building Multidisciplinarity: An Overview

Attempts at multidisciplinarity are not new and were not started by this federal initiative. Thorndike's work in educational psychology, as well as efforts in biochemistry, information science, psychiatric nursing, administration of justice, and other fields serve as precedent. In some of these, the linkage to be made was from discipline to discipline; in others, it was from discipline to practicing profession. LRDC has both of these linkage problems. The example of successful linkage that we cite here is between psychologists and curriculum designers and is the only truly successful example available at the Center. Discipline to discipline linkages, as in the case of psychology to sociology, or psychology to computer science, have been less successful. So, too, have been the linkages between psychological research and educational implementation.

Patterns of multidisciplinarity can be either of the additive or the integrative varieties. In the additive case, disciplines and professions work independently, but organizational design puts the work results together. In the integrative variety a joint task is worked upon so that a transfer of knowledge occurs, accompanied by the opening up of professional

frames of reference and, in the extreme case, a new integrative discipline emerges. The instance we cite of psychologists and designers illustrates a moderate version of the integrative case in the sense that separare identities and domains of work were maintained, while cooperation was encouraged.

We believe that particular conditions are necessary for multidisciplinarity of the integrative variety to occur. (a) Socialization into a professional identity and frame of reference is a basic requisite. (b) Professionals must acquire skills to gain access to alternative frames of reference. This may have occurred in basic professional socialization or in professional resocialization. (c) There must exist relevance structures that motivate the participating actors to place alternative frames of reference into a meaningful configuration so that each can anticipate what might conceivably be learned from the other. These relevance structures tend to be task-oriented activities. A task-oriented activity of the problem-solving and knowledge-producing variety will involve some programmatic conception of what domains of knowledge resources might be appropriate to bring to bear. (d) There must be structural opportunities for an effective division of labor and cooperation, such as provisions for communication, allocation of resources, etc. (e) There must exist incentive to persevere, which may be of the purely cognitive variety in the sense that the task is clearly more easily solvable through a multidisciplinary effort, or may be rewards of a more external nature such as praise, career opportunity and the like. (f) There must be sanctions against leaving the effort, contractually provided work requirements, with possible reduction in research resources or other negative sanctions. (g) The balance between incentives and sanctions is probably most comprehensively symbolized in the status structure of the participating groups. (h) Even if all these elements are present so that the balance of incentives and sanctions increases the attractiveness of multidisciplinarity and decreases its costs, it is only likely to occur successfully if there are cultural models which provide guidance as to how it is to be done.

In the case we have studied, integrative multidisciplinarity was attained in ways which highlight the salience of these last two points in particular. When the Center was begun it was clearly the case that curriculum designers had a status deficit vis-a-vis the psychologists. The very conception of a linear approach to R&D, from research to development, accepted across the country as well as at LRDC at the time, depends for its currency on the notion that research is the dominant activity, propelling and validating all other aspects of development and dissemination.

In order for integrative multidisciplinarity to be realized, LRDC curriculum designers had to achieve some degree of status parity with the psychologists (the high status member of such a dyad has difficulty taking seriously the low status member if he also attends to peer pressure). This occurred slowly, in the following way: A task--the building of individualized curricula--had to be accomplished. Those who worked on the task were successful in producing objects which were visible and were used in schools. Over several years, in fact, these objects became a hallmark of LRDC activity, garnering praise, visibility and resultant increased funding for all Center activity. As that occurred psychologists within the Center, whose livelihood for several years appeared dependent upon the success or failure of the work of the designers, began to reorient their dispositions toward the value of the designers' work, granting it greater validity and prestige.

Finally, a point was reached at which it became feasible to talk in terms of joint work and problem-formulation. Eventually, the psychological research itself became heavily influenced by an instructional focus in large part derived from the orientations of those people previously labeled "curriculum designers."

In the material which follows, we document in detail the way in which this process unfolded at LRDC. We view the process as one of epistemic community development, of building and bridging professional frames of reference. That is, professionals coming to the Center brought

with them performance criteria and standards of judgment from their own training and experience. Each worked in terms of his professional frame of reference, namely, preferred orientations and standards reflecting both his disciplinary background and his goal commitments. This multiplicity of reference frames implies diversity in methodologies and even in tests of what is taken as "true" or "real."

One thing is immediately obvious: cooperation has not caused the obliteration of professional or disciplinary boundaries. The Center's mission called for a division of labor which created a variety of activities and these required different professional expertise. Educators, psychologists, others continued to behave and think of themselves as members of particular disciplines. Most held joint appointments with their disciplinary departments.

One can now speak of the development of an "epistemic community," i.e., a professional community emphasizing shared and specialized epistemic standards. Such a development requires the presence of support mechanisms in the form of boundaries defining the outer limits of the community and of clear channels and criteria for communication within. With reference to LRDC, the concept of epistemic community applies in two ways. There is, first, the Center as a whole. Identification with the LRDC "mission" is, for a large majority of the professionals in the Center, a major component of their career self-image. So, in some sense, the Center as a whole forms an epistemic community (whose most salient reference groups are other similar organizations and professional groups). This group formation process is an important phenomenon in the history of LRDC.

An additional way in which it makes sense to speak of epistemic communities and their development is within LRDC. It is here that we come up against the crux of the issue, i.e., how to construct multidisciplinarity. The formation of a group identity, mentioned above, is helpful but not sufficient. What has appeared to be crucial in the Center's development are several mechanisms which have the effect of creating epistemic

communities by means of transforming role definitions and status hierarchies. These communities have served the purpose of facilitating the Center's goal of providing a multidisciplinary attack on educational problems. At least four such mechanisms are apparent: (a) the rise and professionalization of a new role, the curriculum designer; (b) the creation of an ideal-typical role model, the researcher-developer; (c) the opening-up and modification of traditional frames of reference to accommodate some new components; and (d) the development of an instructional psychology. We shall discuss each of these in turn and conclude with some thoughts on other requisites for the creation of an hospitable multidisciplinary environment.

Mechanisms Aiding Multidisciplinarity

The Rise and Professionalization of the Curriculum Designer

Clearly, people had been writing instructional materials for schools long before the R&D centers came into existence. What was different about the new institutional approach was the goal of bringing educational R&D into the arena of "big science,"[3] and the availability of some of the means for accomplishing that goal. Curriculum design is an activity occupying the interstitial space between the sciences of learning and the arts of teaching. The designer fills a linkage role, a role whose development was crucial to the implementation of LRDC's mission.

The original idea had been to test the feasibility of individualization as a means of adapting to the individual differences among children in a classroom. What started as a feasibility experiment became a design experiment, within a year or so, once initial feasibility had been shown. Still, the nature and purpose of the enterprise remained experimental. The goal was to discover if individualization of instruction were possible, and if possible, if it were highly desirable. The goal was not to develop a particular set of individualized curricular materials. There were problems in this however: (a) in order to conduct the experiment, some set of materials had to be devised; (b) these attracted attention and others wished

to have them or similar materials; (c) some people, outside of the Center, urged product, rather than just process, development; (d) over time, Individually Prescribed Instruction, as the growing experiment came to be known, accrued a staff with particular content orientations and a growing desire to produce their own materials, for the reasons just listed as well as others.

By the end of the sixties what had been the "IPI project" became separate projects in reading, mathematics, science, perceptual skills and computer applications. In each of these areas subject matter expertise now existed. And, by 1970, the designers creating these curricula had developed a professional standing, based on their expertise within the Center's organization. In the earlier years, design was viewed as a simple task, an extension into practice of theory and basic research. Later, it became more clear how complex the task was: different subject matters place particular constraints or requisites on instructional design; different subject matters may require different "mixes" of theoretical background; as subject matter instruction was designed for various age-groups, their differing developmental characteristics posed their own set of needs. It became more and more obvious that a particular set of skills were required to design curricula, that this was a role in its own right and not simply an extension of some other role. Many curriculum designers were at one time classroom teachers and this was probably an important contribution to their design skills. Yet, clearly, curriculum design was no more a mere extension of the classroom teacher role than it was of the role of the learning theorist.

Designers as a group became aware of some of the commonalities of their frames of reference which set them apart, as a group, from other professions, such as the psychologists in the Center. They shared some criteria for appropriate performance, criteria which flowed from the nature of the work they were accomplishing. They possessed a set of characteristics which created a group identity, which differentiated them from other distinct groups, e.g., psychologists doing laboratory research.

They had designated their role "developer," at an earlier date, and they used this label to refer to themselves and others as distinct from the "researchers." Some began to think of themselves as "designers," with the attendant implications that the analogue to environmental design suggested. They spoke of their work as containing both an engineering and an aesthetic component. They perceived that their work was not simply a "service" for either school people or researchers, but was a distinct activity with validating norms of its own. These individuals also shared a belief in the value of discipline-based application, an indicator of both individual commitment and organizational purpose. Most clearly, they were vocal about the inability of those who had not shared their activity to understand it fully. In these ways, developers, or designers, made clear their self-identification as a distinct community.

The growing of that community, its unique characteristics which differentiated it from other communities within the Center, was an essential step in the creation of the enduring multidisciplinary climate. Until such unique differences were granted full credence by the psychologists until the validity and distinction of roles based on varying disciplinary bases was fully recognized, first by those outside of, later those within LRDC, multidisciplinary communication did not exist. The development of a role "designer," of a community of such roles, albeit defined with variations within the community, was a necessary subgoal of mission fulfillment.

Another indicator of the same phenomenon, and one whose history is itself indicative of the evolution of thought on the issue, is the notion of the "ideal" role, researcher-developer.

The Evolution of a Normative Type

In the first years, the top professional staff at LRDC, as well as in R&D efforts across the country envisioned the core processes as linear ones, from research to development. Before very long, people began to realize the inaccuracy of this model for their sort of R&D. It neither described the way the world was nor the way it should be for fruitful educational R&D to proceed. A succession of "models" followed this one and

what has been realized to date is that there is not yet any single, general solution.

The various models of activity had implicit within them role definitions. The linear view of R&D gave prime importance to research and the role of the researcher. At that time, development or design was viewed as an extension of research, and the designer as an extension of the researcher role. As the role of the designer took form and substance during the sixties, becoming distinct, a role conception took hold, especially among the community of psychologists in the Center, which came to be labeled the "researcher-developer." This notion was at its height at the end of the sixties when an individual's simultaneous involvement in research and development was posited, by the Center directorate, as the most desirable way for work to proceed. This notion is both an extension of the earlier, linear model and a wakening recognition that two different kinds of activity are implied. In the early seventies, designers began to speak of themselves as engaging in research. When what they were saying was understood, when the unique attributes of these two activities were fully appreciated and the near equality of the designer's status had been recognized, then multidisciplinary communication can be said to have been occurring. (This probably did not happen fully until 1972 or 1973.)

Some people in the Center still think that the researcher-developer combined role is the ideal one. Perhaps it is. But what has changed over time is: (1) the recognition that this is an "ideal type" and not essential for either the conduct of good research or good development; and (2) the recognition that this can be a normative model either for researchers or developers. The evolution of this notion--from a hyphenated extension of a single role to a combination of two roles--reflects the evolution of thinking about R&D activity. It mirrors the development of the rise of the new epistemic community, that of designers. It parallels the development of the third mechanism for building multidisciplinarity, the opening up of what came to be perceived as distinct frames of reference.

The "Opening Up" of Reference Frames

The development of a new role and the evolution of an ideal type, described above, are both examples of mechanisms which helped to create a multidisciplinary climate within LRDC. The rise and recognition of distinct epistemic communities, each with its own particular frame of reference, led to a third mechanism for coping with the inherent communication problems and for furthering the LRDC climate. It was the "opening up" of frames of reference. This was accomplished not so much to encompass new components, for then the process might be referred to as "broadening," but rather to comprehend, in deeply meaningful ways, the rules governing previously unfamiliar behavior. (To the extent that two different frames of reference include contradictory components certainly encompassing both simultaneously is out of the question.)

What is meant, concretely, is this: differing epistemologies, as represented by different activity spheres within LRDC, are rooted in different conceptions of knowledge production strategies. Some of the elements of these strategies which vary are problem-detection, problem-solution and solution-implementation processes. These processes are fundamentally and significantly different if, for example, comparison were between the question, "How is information stored in memory?" and "What is an optimal strategy for creating an environment which will foster student self-direction?" Investigation of both of these questions is central to the mission of LRDC. Yet clearly they require very different procedures. Some of the epistemic criteria to be met in each case are defining: (a) the appropriate object or unit of study; (b) the appropriate methdology including relevant and feasible control/generalization mechanisms; (c) the appropriate truth tests or definitions of what constitutes "knowledge;" (d) related to (c), the appropriate amount of time which is required to help to assure validity; and (e) the appropriate audience and communication channels with that audience for transmission of the knowledge generated. How can people involved in these two desparate kinds of activities effectively work with one another? Normally, they are not able to work together and the reasons for this inability go beyond differences in content. They are far more significantly

rooted in process. It was on this level, communication across process differences, that LRDC needed to establish channels.

Indicators of the "opening up" of reference frames are the degrees of success of the mechanisms established as facilitators of this process. For example, there is the area of Center publications. From the start Center members were encouraged by the Directorate to publish articles about their work at LRDC. A Center publications series was set up, which included not only reprints but also working papers, monographs, and other technical reports. From 1964 to 1970, internal review of articles and drafts was an idiosyncratic process: one Director and his assistant read and sometimes edited papers. These were sometimes forwarded for comment to some other Center members, selected by unknown criteria. The Director kept tight control over the process. In 1970, an official publications committee was established and membership on the committee became rotating and for two year terms.

From 1970 to the present, this committee, which includes a variety of Center professionals, has functioned as a review body, offering suggestions, criticisms, revisions or whatever seems advisable. Papers by Center members have been rejected and many have been returned to their authors with changes suggested before publication is recommended. Discussion at publications committee meetings is spirited and misunderstandings do sometimes occur. But on the whole, what is clear is each committee member's attempt to move outside of his own frame of reference, where necessary. In fact, what appears to happen is that Committee members internalize a set of criteria related to the Center's mission, which both includes and is broader than a single disciplinary set. Papers are judged both in terms of their discipline base and in terms of their contribution to an understanding of what LRDC is about.

That this whole system is workable now, as it was not in the earlier years of the Center's development, is one indication of the ability of Center members to transcend their own frames of reference when that is called for. The discussion of the publications committee at work offers

the most tangible example. Other discussions, at colloquia or internal planning meetings, for example, also provide confirmation for this point. Miscommunication, or the inability to comprehend another frame of reference, is more obvious than smooth communication. And such miscommunication continues to occur. But the frequency of clear communication which involves the necessity for speaker and listener to "open up" their frames of reference is quite high.

The Development of an Instructional Psychology

During the first decade at the Center, the most salient group to watch was the curriculum designers. The development of that role and the validation accorded its knowledge base was an essential first step to building multidisciplinarity. What has been most interesting to watch in the past several years has been the transformation of the psychologists. This transformation can be seen both in the way they define their work and the way they define themselves.

When LRDC was established, the psychology conducted at it sprang from a fairly narrow conceptual base. It has broadened significantly over the years. Most important, the psychologists' work has gone from a focus on traditional variables associated with learning to studies, informed from their very conception, by a concern for instruction.

The Center has frequently reorganized, with the composition and structure of projects and programs changing as it appeared necessary. The most recent organizational shifts, in the summer of 1976, mirror in part the changing view of the psychologists we've just mentioned. Previously, various mechanisms for bringing together, e.g., psychologists studying text comprehension and designers constructing reading curricula were tried. The latest organization of the Center is such that in the two major substantive areas--analysis of basic skills and language communication--working units now comprise both psychologists and designers. Working together now on a day to day basis, these two previously disparate groups are jointly formulating problems, devising and revising methodologies, and analyzing results. At least, this is true for a great deal of the

work, some remains disparate. Yet, this partial maintenance of separate intellectual identities (reinforced by membership in different departments within the University and therefore by different teaching concerns) is probably necessary.

What is now recognized by both researchers and designers is what each can learn from the other and how joint work is facilitative. This could not have occurred until: (a) the knowledge base of the curriculum designer acquired validity in the eyes both of the design group itself and other groups; and (b) the definition of the psychological work was reshaped by instructional concerns.

Building Multidisciplinarity: Factors in Support

We have discussed four mechanisms which have had the effect of partially creating and validating the existence of separate epistemic communities within LRDC. Starting in 1964 with primary recognition given to only one, the psychologists, LRDC members over time came to recognize the distinctiveness of the several activities being conducted. This, in turn, was underlaid by a more basic process--the coming closer to status parity of researchers and developers. A new role, the instructional designer, was recognized as such. An ideal, complex role model, the researcher-designer, evolved as the distinction between these two activities became clearer. The necessity for and ability of Center members to move each outside of his own frame of reference further confirmed the existence of, and respect for, the validity of such distinctions. Finally, the psychologists themselves underwent role transformation.

In order for this to occur, certain structural supports were essential.[4] The organizational mission, provided a reason for establishing such a Center. The problems to be tackled demanded a multidisciplinary approach. The mission was stated in broad enough terms to encompass a variety of activities and to encourage each Center member to find a place for his or her work in the overall scheme.

The people who formed this new community had some common characteristics which set them apart from their colleagues at the University. These were individuals willing to risk involvement in an innovative venture. There appear to be several reasons for this willingness: (a) some few were so secure in their base discipline--in the main, education or psychology--that failure would have had to be of quite significant proportions before the individual's reputation was endangered; (b) it was rather more often the case that those who became successful were relatively young, ambitious, open to resocialization, and were virtually unestablished in other University professional settings, as they built their reputations in Schools and Departments of the University concomitant with their growing careers in the Center.

In addition, it was true of the designers that most had disciplinary ties to departments within the School of Education. Working in a multidisciplinary enterprise with psychologists was viewed--by the outside world--as an opportunity for theory to enrich practice, and was less a risk for educators than for psychologists. (That practice is essential for the enrichment of theory is a notion given lip service far more often than credit in an academic environment.)

For whatever reasons then these were university people willing to risk pursuing their work under the aegis of a new enterprise which, at the worst, might have failed and at the best, could be predicted to be misunderstood by their colleagues. Further, they shared a belief in the importance of the task; they were committed, ideologically, if sometimes incapable behaviorally, to closing the gap between science and practice in education.

Finally, and very importantly, the environment was right. There was time, a crucial factor, to allow the organization to grow, take shape and achieve some accomplishments.[5] Internally, a supportive environment for research and development was created by the establishment of an administrative structure which allowed and facilitated intellectual work. Such support systems are essential to the creation of an environment in which varied tasks must be performed and coordinated to achieve organizational purpose.

Externally, in the Center's most immediate environment, the University, certain arrangements were made or evolved which also appear to have been important in the Center's growth. First, through the Federal guidelines for establishing Centers stipulated that each be located in a university, the Centers' place within the university was not stipulated. Some of the educational R&D centers became part of schools of education.

The LRDC was set up organizationally on a par with other schools. Its Directors report to the Provost of the University. Faculty level members of the Center, in the overwhelming majority, hold joint appointments with other schools and departments at Pitt. These faculty are reviewed for promotion jointly by the Center and their departments. Though no formal courses are offered by the Center, graduate students from several departments work as research assistants. Finally, the leadership of the Center has been fairly stable over time. More importantly, the leadership style has been a relatively open, reflective one.[6]

The building of a multidisciplinary community, or communities within, evolved, and continues to, since 1964. It is not a process which can be "legislated." There are, undoubtedly, other ways for such communities to come into existence than the pattern followed by LRDC. Specifically, one facilitating mechanism would be training programs which foster the kinds of perspectives these new organizations and new tasks require.[7] In LRDC's case, time, tasks, reflection, adaptive professionals, and certain structural considerations made multidisciplinarity possible.

Hypotheses, Suggestions or "Lessons" Learned

It is difficult, though not impossible, to draw some conclusions from a single case that would be useful for others. Yet, our "case" is a substantial one--an entire organization. In addition, we have listened, read and picked up clues when we could from the similar experiences of others.

Several aspects of the LRDC experience offer themselves as at least logical suggestions to others who would seek to construct a multidisciplinary organization. We wish to underline our conviction that the way LRDC evolved is not the only way. But its evolution does point to some tentative conclusions.

--In an environment which contains members of several professional or academic backgrounds, certain safeguards are required for those of lower "status." Regardless of the academic mythology of equality, it is well known that certain disciplines have higher status rankings than others. These differences are sometimes referred to as "more or less scientific." Translation of that thought is simplified by realizing that for many in academe there is a value gradient from very scientific to non-scientific. This being so, "less" scientific fields--and newly developing areas within established fields--should in a multidisciplinary environment be provided with both some degree of protection and nurturance. They need to be insulated against inappropriate performance demands that would distort the nature of their work. It is probably also essential that a "critical mass" of such people be assembled, the actual number depending upon the size of the entire organization.

--While isolation, even protection, of some kinds is desirable, in order to maintain and build identities which are valued, there should be frequent attempts at communication among all groups. As far as is possible, such communication should be non-threatening to any group involved.

--Perhaps the most important form of communication, and one of the best paths to multidisciplinarity, is joint work. For disciplines truly to become enmeshed there is a strong need for a task orientation and perhaps the most potent task is problem-solving. Other combined work such as the production of joint publications, long-range planning or project administration will probably follow more easily after a problem has been faced together and a reasonable--and undoubtedly a compromise--solution strategy has been found.

--Certain kinds of professionals--and/or certain times in a professional's career--seem to lend themselves more easily to a multidisciplinary endeavor. It would certainly seem that socialization of a professional early in his or her career and shaping his view within a multidisciplinary environment would be the easiest route to follow. Such an early socialization model however has at least one potential danger: the professional may fail adequately to build an arsenal of discipline-based skills and knowledge and can find himself with little to rely on. Another approach is to attract to a multidisciplinary organization those individuals whose security is so ensured that any engagements they choose will not endanger it. A third path is to attract those relatively secure or unrooted who are high risk takers and who perceive the possibility for more rapid or more enhanced mobility within the new, unorthodox setting than within more traditional ones. Perhaps some mixture of these types is ideal.

--When it is feasible, the creation of ideal-type roles which embody characteristics of several disciplines serves as a prototype for the entire larger environment. This is not the same thing as having an institutional objective which subsumes all the variety of activity. That is another supportive mechanism. Rather, this creation is the model in encapsulated microcosm of the interactions which are supposed to characterize all actors in the system.

--In addition, certain organizational characteristics facilitate multidisciplinarity. By placing an organization on the same level, in terms of the authority hierarchy, with those other organizations with which it must share personnel and some other resources, the organization is offered the possibility of a degree of autonomy or status equality with these other units it would not possess if it were part of one of those organizations. Such a status facilitates its building of its own value system.

--Related to the point just above, is one regarding shared top level personnel. In the academic setting these are faculty. If their traditional, insular, discipline-bound view of knowledge is to be overcome and another substituted for it, then there must be a viable system of rewards

for this change. Operationally, within the university, this means that the multidisciplinary center and the department or school to which a faculty member also belongs must both actively participate in a person's review and decisions regarding promotions and raises. Departments tend to pull academics toward insular discipline-based knowledge production and encourage as much of that activity as is feasbile. A multidisciplinary center pulls the professional away from the single-discipline view. It frequently encourages work which will take a great deal of time to complete. So, the time lines and expectations for knowledge production are altered. These conflicting expectations must be carefully negotiated in any personnel review.

--Finally, we reiterate an earlier point, though with a hesitation brought on by the relization that this is a factor frequently beyond the control of the organization. Time is of the essence, but not in the sense in which that was originally said. The necessity for a stable environment which will provide time and other resources for multidisciplinary knowledge production to take place cannot be overemphasized. This is a "lesson" or suggestion as much for those who fund and oversee the knowledge production as for those who conduct it. Multidisciplinary R&D cannot in honesty promise much of value that will be accomplished quickly. It should not be expected to do so.

Footnotes

[1] There has been a widely-held prejudice that professional socialization ends with graduate education and that further experiences can only be additive to, rather than integrated with, a professional frame of reference. As we proceed to show in this analysis, that view need no longer be held. For a more common explanation of the rationale for the R&D centers program, one which stresses organizational setting and federal policy rather than role transformations, see N. J. Boyan and W. S. Mason, "Perspectives of educational R&D centers," Journal of Research and Development in Education, 1:4, Summer, 1968.

[2] For more extensive background on the Learning Research and Development Center, see L. Salmon-Cox and B. Holzner, "The Learning Research and Development Center at the University of Pittsburgh, an assessment of organizational experience with educational R&D," Report to the Board of Visitors, January 1976 and "The adaptive education program: plans for research and development," Learning Research and Development Center, October, 1976.

[3] We have discussed this in some detail in B. Holzner, L. Salmon-Cox, "Conceptions of research and development for education in the United States," Annals of the American Academy of Political and Social Science, in press.

[4] A discussion similar to our own, which places particular emphasis on structural supports, may be found in H. G. Petrie, "Do you see what I see? The epistomology of interdisciplinary inquiry," Educational Researcher, February, 1976.

[5] An interesting confirmation of some of what we have observed was provided quite recently in a talk given by Dr. Millie Almy, of the University of California at Berkeley. Dr. Almy visited Pittsburgh in late January 1977 and spoke of experiences she and her colleagues have had, in the past four years, setting up an interdisciplinary program for graduate education. What they discovered about themselves, about the difficulty of the task and about some requirements for task solution were very similar to what we have observed. As Dr. Almy said it would be impossible to overestimate the necessity for time--time for program planning, time for program implementation, time, especially, for coming to grips with the "differening cognitive maps" participants bring to a multidisciplinary effort.

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[6] Leadership of such an organization is a large subject in itself. We mention it here only in its supportive role of the main consideration of this paper.

[7] One such program was the Multi-Disciplinary Graduate Study Program, an LRDC activity under the direction of Paul Lazarsfeld and Evelyn Fisher. In existence from 1972 to 1975, it was terminated because of a lack of support for such training programs at the federal level.